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1 Input interaction: Shorthand writing on stylus keyboard
Shumin Zhai, Per-Ola Kristensson
April 2003 **Proceedings of the SIGCHI conference on Human factors in computing systems**
Publisher: ACM Press
Full text available: pdf(275.25 KB) Additional Information: full citation, abstract, references, citings, index terms

We propose a method for computer-based speed writing, SHARK (shorthand aided rapid keyboarding), which augments stylus keyboarding with shorthand gesturing. SHARK defines a shorthand symbol for each word according to its movement pattern on an optimized stylus keyboard. The key principles for the SHARK design include high efficiency stemmed from layout optimization, duality of gesturing and stylus tapping, scale and location independent writing, Zipf's law, and skill transfer from tapping to sho ...

Keywords: handheld devices, mobile, pervasive computing, text input, text-entry

2 Automatic Steno translation
Raoul N. Smith
August 1973 **Proceedings of the annual conference**
Publisher: ACM Press
Full text available: pdf(515.55 KB) Additional Information: full citation, abstract, references, index terms

The first preliminary computer translation of machine produced stenographic notes was described in Salton 1959. Since then other approaches have been suggested but none seem to have succeeded. In the meantime the need for a solution becomes more and more pressing. The impetus for a solution is coming from two user areas—court reporting and speech recognition. The purpose of this paper is to describe the problems and solutions to the problems of automatic Steno-English trans ...

3 Computer programs for detecting and correcting spelling errors
James L. Peterson
December 1980 **Communications of the ACM**, Volume 23 Issue 12
Publisher: ACM Press
Full text available: pdf(1.25 MB) Additional Information: full citation, abstract, references, citings

With the increase in word and text processing computer systems, programs which check

and correct spelling will become more and more common. Peterson investigates the basic structure of several such existing programs and their approaches to solving the problems which arise when this type of program is created. The basic framework and background necessary to write a spelling checker or corrector are provided.

Keywords: spelling, spelling correction, spelling dictionary, spelling programs

4 Gestures: SHARK^2: a large vocabulary shorthand writing system for pen-based computers

Per-Ola Kristensson, Shumin Zhai

October 2004 **Proceedings of the 17th annual ACM symposium on User interface software and technology**

Publisher: ACM Press

Full text available: pdf(321.66 KB) Additional Information: full citation, abstract, references, index terms

Zhai and Kristensson (2003) presented a method of speed-writing for pen-based computing which utilizes gesturing on a stylus keyboard for familiar words and tapping for others. In SHARK², we eliminated the necessity to alternate between the two modes of writing, allowing any word in a large vocabulary (e.g. 10,000-20,000 words) to be entered as a shorthand gesture. This new paradigm supports a gradual and seamless transition from visually guided tracing to recall-based ges ...

Keywords: gesture recognition, shorthand, shorthand recognition, stenography, text input

5 Projecting the future: Interactive environment-aware display bubbles

Daniel Cotting, Markus Gross

October 2006 **Proceedings of the 19th annual ACM symposium on User interface software and technology UIST '06**

Publisher: ACM Press

Full text available: pdf(28.27 MB) Additional Information: full citation, abstract, references, index terms

We present a novel display metaphor which extends traditional tabletop projections in collaborative environments by introducing freeform, environment-aware display representations and a matching set of interaction schemes. For that purpose, we map personalized widgets or ordinary computer applications that have been designed for a conventional, rectangular layout into space-efficient bubbles whose warping is performed with a potential-based physics approach. With a set of interaction operators b ...

Keywords: adaptive displays, focus and context, imperceptible structured light, interaction, projectors, tabletop

6 Tailor: creating custom user interfaces based on gesture

Randy Pausch, Ronald D. Williams

August 1990 **Proceedings of the 3rd annual ACM SIGGRAPH symposium on User interface software and technology**

Publisher: ACM Press

Full text available: pdf(1.14 MB) Additional Information: full citation, references, citings, index terms

7 Long papers: natural language and gestural input: Relaxing stylus typing precision by geometric pattern matching

Per-Ola Kristensson, Shumin Zhai
January 2005 **Proceedings of the 10th international conference on Intelligent user interfaces**
Publisher: ACM Press
Full text available: pdf(219.35 KB) Additional Information: full citation, abstract, references, index terms

Fitts' law models the inherent speed-accuracy trade-off constraint in stylus typing. Users attempting to go beyond the Fitts' law speed ceiling will tend to land the stylus outside the targeted key, resulting in erroneous words and increasing users' frustration. We propose a geometric pattern matching technique to overcome this problem. Our solution can be used either as an enhanced spell checker or as a way to enable users to escape the Fitts' law constraint in stylus typing, potentially result ...

Keywords: Fitts' law, spell checker, stylus keyboard, text input, typing correction, typing errors, virtual keyboard

8 Automatic error-correction in natural languages
A. J. Szanser
September 1969 **Proceedings of the 1969 conference on Computational linguistics**
Publisher: Association for Computational Linguistics
Full text available: pdf(359.59 KB) Additional Information: full citation, abstract, references

Automatic error-correction in natural language processing is based on the principle of 'elastic matching'. Text words are segmented into 'lines' with letters arranged according to a pre-determined sequence, and then matched line-by-line, shifts being applied if the numbers of lines are unequal.In order to resolve the possible multiple choices produced, the method may be supplemented by another one, based on the observed repetition of words in natural texts, and also by syntactic analysis.This pa ...

9 Doctoral consortium: Breaking the laws of action in the user interface
Per-Ola Kristensson
April 2005 **CHI '05 extended abstracts on Human factors in computing systems**
Publisher: ACM Press
Full text available: pdf(69.09 KB) Additional Information: full citation, abstract, references, index terms

Fitts' law, Steering law and Law of crossing, collectively known as the laws of action, model the speed-accuracy trade-offs in common hci tasks. These laws impose a certain speed ceiling on precise actions in a user interface. My hypothesis is that for some interfaces, the constraints of these laws can be relaxed by using context information of the task. To support this thesis, I present two systems I have developed for pen-based text input on stylus keyboards. These systems break either Fitts' ...

Keywords: Fitts' law, laws of action, pattern recognition, shorthand, stylus keyboard

10 Functional declarative language design and predicate calculus: a practical approach
Raymond Boute
September 2005 **ACM Transactions on Programming Languages and Systems (TOPLAS)**, Volume 27 Issue 5
Publisher: ACM Press
Full text available: pdf(430.46 KB) Additional Information: full citation, abstract, references, index terms

In programming language and software engineering, the main mathematical tool is *de facto* some form of predicate logic. Yet, as elsewhere in applied mathematics, it is used mostly far below its potential, due to its traditional formulation as just a topic in logic instead of a calculus for everyday practical use.The proposed alternative combines a

language of utmost simplicity (four constructs only) that is devoid of the defects of common mathematical conventions, with a set of convenient ...

Keywords: Analysis, Leibniz's principle, binary algebra, calculational reasoning, databases, declarative languages, elastic operators, function equality, functional predicate calculus, generic functionals, limits, program semantics, programming languages, quantifiers, recursion, software engineering, summation

11 Courses: Discrete differential geometry: an applied introduction

Eitan Grinspun, Mathieu Desbrun
July 2006 **Material presented at the ACM SIGGRAPH 2006 conference SIGGRAPH '06**
Publisher: ACM Press
Full text available: pdf(4.80 MB) Additional Information: full citation, abstract

An introduction to fundamentals of discrete differential geometry (DDG), a nascent area of computational science with exciting simulation and geometry processing applications. Lectures discuss continuous and discrete geometry in the context of cloth, shell, and fluid simulation as well as remeshing and parameterization problems.

12 Courses: An introduction to sketch-based interfaces

Joseph LaViola, Randall Davis, Takeo Igarashi
July 2006 **Material presented at the ACM SIGGRAPH 2006 conference SIGGRAPH '06**
Publisher: ACM Press
Full text available: pdf(31.58 MB) Additional Information: full citation, abstract

Sketch-based interfaces are a natural, pencil-and-paper-like approach to interacting with a variety of applications, including conceptual modeling, animation, and note-taking systems. This course offers an in-depth discussion of sketch-based interface design, ranging from simple gestural commands to complex sketch-understanding systems. Attendees will learn how these interfaces are designed and how to develop their own.

13 Motion sketching for control of rigid-body simulations

Jovan Popović, Steven M. Seitz, Michael Erdmann
October 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 4
Publisher: ACM Press
Full text available: pdf(156.23 KB) Additional Information: full citation, abstract, references, citings, index terms, review

Motion sketching is an approach for creating realistic rigid-body motion. In this approach, an animator sketches how objects should move and the system computes a physically plausible motion that best fits the sketch. The sketch is specified with a mouse-based interface or with hand-gestures, which move instrumented objects in the real world to act out the desired behaviors. The sketches may be imprecise, may be physically infeasible, or may have incorrect timing. A multiple-shooting optimizatio ...

Keywords: Physically based animation, animation with constraints, user interface design

14 The elements of nature: interactive and realistic techniques

Oliver Deusen, David S. Ebert, Ron Fedkiw, F. Kenton Musgrave, Przemyslaw Prusinkiewicz, Doug Roble, Jos Stam, Jerry Tessendorf
August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04**
Publisher: ACM Press
Full text available: pdf(17.65 MB) Additional Information: full citation, abstract

This updated course on simulating natural phenomena will cover the latest research and production techniques for simulating most of the elements of nature. The presenters will provide movie production, interactive simulation, and research perspectives on the difficult task of photorealistic modeling, rendering, and animation of natural phenomena. The course offers a nice balance of the latest interactive graphics hardware-based simulation techniques and the latest physics-based simulation techni ...

15 Styles of human motion: Learning physics-based motion style with nonlinear inverse optimization

C. Karen Liu, Aaron Hertzmann, Zoran Popović

July 2005 **ACM Transactions on Graphics (TOG)**, Volume 24 Issue 3

Publisher: ACM Press

Full text available: pdf(620.56 KB) Additional Information: full citation, abstract, references, citings, index terms

This paper presents a novel physics-based representation of realistic character motion. The dynamical model incorporates several factors of locomotion derived from the biomechanical literature, including relative preferences for using some muscles more than others. elastic mechanisms at joints due to the mechanical properties of tendons, ligaments, and muscles, and variable stiffness at joints depending on the task. When used in a spacetime optimization framework, the parameters of this model de ...

Keywords: character animation, inverse optimization, motion style, physics-based animation

16 An algebraic array shape inference system for MATLAB®

Pramod G. Joisha, Prithviraj Banerjee

September 2006 **ACM Transactions on Programming Languages and Systems (TOPLAS)**, Volume 28 Issue 5

Publisher: ACM Press

Full text available: pdf(1.03 MB) Additional Information: full citation, abstract, references, index terms

The problem of inferring array shapes ahead of time in languages that exhibit both implicit and dynamic typing is a critical one because the ramifications of its solution are the better organization of array storage through compaction and reuse, and the generation of high-performance code through specialization by shape. This article addresses the problem in a prototypical implicitly and dynamically typed array language called MATLAB. The approach involves modeling the language's shape semantics ...

Keywords: Typeless array languages, shape algebras, term rewriting

17 On light and heavy traffic approximations of balanced fairness

Thomas Bonald, Aleksi Penttinen, Jorma Virtamo

June 2006 **ACM SIGMETRICS Performance Evaluation Review , Proceedings of the joint international conference on Measurement and modeling of computer systems SIGMETRICS '06/Performance '06**, Volume 34 Issue 1

Publisher: ACM Press

Full text available: pdf(284.03 KB) Additional Information: full citation, abstract, references, index terms

Flow level analysis of communication networks with multiple shared resources is generally difficult. A recently introduced sharing scheme called balanced fairness has brought these systems within the realm of tractability. While straightforward in principle, the numerical evaluation of practically interesting performance metrics like per-flow throughput is feasible for limited state spaces only, besides some specific networks where the results are explicit. In the present paper, we study the beh ...

Keywords: balanced fairness, elastic traffic, flow level analysis, throughput approximation

18 Robust treatment of collisions, contact and friction for cloth animation

Robert Bridson, Ronald Fedkiw, John Anderson

July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques SIGGRAPH '02**, Volume 21 Issue 3

Publisher: ACM Press

Full text available: pdf(3.74 MB) Additional Information: full citation, abstract, references, citings, index terms

We present an algorithm to efficiently and robustly process collisions, contact and friction in cloth simulation. It works with any technique for simulating the internal dynamics of the cloth, and allows true modeling of cloth thickness. We also show how our simulation data can be post-processed with a collision-aware subdivision scheme to produce smooth and interference free data for rendering.

Keywords: cloth, collision detection, collision response, contacts, kinetic friction, physically based animation, static friction

19 Sample-based non-uniform random variate generation

Luc Devroye

December 1986 **Proceedings of the 18th conference on Winter simulation**

Publisher: ACM Press

Full text available: pdf(545.00 KB) Additional Information: full citation, abstract, references, citings, index terms

A sample of n lid random variables with a given unknown density is given. We discuss several issues related to the problem or generating a new sample of lid random variables with almost the same density. In particular, we look at sample independence, consistency, sample indistinguishability, moment matching and generator efficiency. We also introduce the notion of a replacement number, the minimum number of observations in a given sample that have to be replaced to obtain a ...

20 The Yampa arcade

Antony Courtney, Henrik Nilsson, John Peterson

August 2003 **Proceedings of the 2003 ACM SIGPLAN workshop on Haskell Haskell '03**

Publisher: ACM Press

Full text available: pdf(698.62 KB) Additional Information: full citation, abstract, references, citings, index terms

Simulated worlds are a common (and highly lucrative) application domain that stretches from detailed simulation of physical systems to elaborate video game fantasies. We believe that Functional Reactive Programming (FRP) provides just the right level of functionality to develop simulated worlds in a concise, clear and *modular* way. We demonstrate the use of FRP in this domain by presenting an implementation of the classic "Space Invaders" game in Yampa, our most recent Haskell-embedded inc ...

Keywords: FRP, Haskell, functional programming, hybrid modeling, modeling languages, synchronous dataflow languages